

* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

(57) [Claim(s)]

[Claim 1] The leadframe for semiconductor devices characterized by being formed at the thickness whose Au plating coat is 0.001-0.1 micrometers on this Pd formed in the outer lead of said leadframe while Pd or Pd alloy coat with a thickness of 0.3 micrometers or less was formed through the direct or substrate metallic film all over the material, or Pd alloy coat in the leadframe for semiconductor devices by which the metallic film of two or more layers was formed in the material side.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

(Field of the Invention)

This invention relates to the leadframe for semiconductor devices.

(A Prior art and its trouble)

It is required that the leadframe for semiconductor devices should have the good junction nature of a semiconductor chip and the good wirebonding nature of the wire which connects an inner lead with a semiconductor chip, and it should have the good soldering nature in the case of connection with the external instrument of an outer lead.

Therefore, in order to form Part Ag or a partial Au plating coat in the chip loading section and an inner lead in order to obtain the good junction nature or the good wirebonding nature of a semiconductor chip, and to obtain good soldering nature to an outer lead on the other hand conventionally, he is trying to form a solder coat. However, the man day increased and it was very uneconomical to have formed a metallic film of a different kind in the chip loading section, an inner lead, and an outer lead in this way.

So, in recent years, the leadframe which formed Pd or Pd alloy coat in the chip loading section, the inner lead, and the outer lead is beginning (JP,59-168659,A) to be used. Since Pd or Pd alloy coat is chemically stable, it has the good junction nature of a semiconductor chip, and good wirebonding nature, and since solder wettability is also

good, the soldering nature of an outer lead is also good. Moreover, since Pd or Pd alloy coat is formed all over a leadframe, there is an advantage which can also perform simplification of a process.

(Object of the Invention)

However, it became clear that there were the following troubles also in the above-mentioned leadframe for semiconductor devices.

In the semiconductor device of these days, a still severer thing has come [namely,] to be required of the property. As mentioned above, although it is chemically stable and may be satisfied with properties, such as wirebonding nature, once, also when the above-mentioned severe demand cannot be met, it has come to produce Pd or Pd plating coat. For example, although there was no problem in the junction nature of a semiconductor chip, and wirebonding nature, by the heat histories in the case of junction of a semiconductor chip etc., Pd or Pd alloy coat of an outer lead also deteriorated slightly by oxidation, and the problem to which solder wettability falls by the soldering process used as a back process produced it. It being difficult to secure the wetted area more than ratio demanded, for example, 90%, also in respect of the wetted area ratio of solder and the problem which it gets wet, and a rate is slow, therefore must be immersed in a long duration solder bath, and is inferior to workability has produced the wettability of this solder.

Especially the place that it was made that this invention should cancel such a trouble, and is made into the purpose is to offer the leadframe for semiconductor devices which can raise soldering nature.

(The means for solving a technical problem)

In the leadframe for semiconductor devices concerning this invention for the above-mentioned purpose, while 0.3-micrometer or less Pd in thickness or Pd alloy coat is formed through the direct or substrate metallic film all over the material, it is characterized by being formed at the thickness whose Au plating coat is 0.001-0.1 micrometers on Pd formed in the outer lead of said leadframe, or Pd alloy coat.

(Operation)

As mentioned above, although Pd or Pd alloy coat is excellent in the junction nature of a semiconductor chip, wirebonding nature, and soldering nature, it deteriorates by the heat history and has the problem to which the soldering nature of an outer lead falls.

On the other hand, although Au plating coat has thermal stability and being excelled in soldering nature, if it forms thinly in order for cost to go up and to avoid this, if it thickness-attaches and carries out, soldering nature will be checked by oxidation of a material metal or a substrate metal etc.

In this invention, Au plating coat was thinly formed on Pd or Pd alloy coat. Both faults are filled up by this and the soldering nature of an outer lead improves. That is, since Au plating coat acts as a protective layer of Pd or Pd alloy coat, degradation by oxidation of Pd or Pd alloy coat is prevented and Au plating coat, on the other hand, does not have a bad influence from Pd or Pd alloy coat of a substrate as it is thin, the original good

soldering nature of both coats is maintainable. Consequently, very good soldering nature is obtained from the property of both coats being demonstrated to the maximum extent. Moreover, especially solder **** time amount can be shortened and workability improves.

(Example)

The example with suitable this invention for below is explained to a detail based on an accompanying drawing.

In the leadframe 10 shown in Fig. 1 , 12 is connected to rails 20 and 20 by the support bar 18 in the chip loading section in which, as for an outer lead and 14, an inner lead is carried, and, as for 16, a semiconductor chip (not shown) is carried. 22 is a dambar. a semiconductor device [on a leadframe 10, the necessary metallic film which carries out a postscript is formed, a semiconductor chip is carried in the chip loading section 16 the back, this semiconductor chip and inner lead 14 are connected with a wire, and the closure of a semiconductor chip, a wire, and the inner lead 14 is carried out with closure resin, and] -- it is completed. the outer lead 12 top of this semiconductor device -- oh, a **** solder coat is formed, or a solder coat is formed at the time of mounting to a substrate, and it is soldered to the predetermined location on a substrate.

In this invention, it is characterized by forming Pd or Pd alloy coat the whole surface on a leadframe material, and forming Au plating coat thinly on it further.

Especially the material of a leadframe can use materials usually used, such as Cu or Cu alloy, and a Fe-nickel alloy, without being limited.

As shown in Fig. 2 , Pd or Pd alloy coat 24 is formed through the substrate plating coats 26, such as nickel plating coat, on a material, or is directly formed on a material depending on the quality of the material of a material. As a Pd alloy, a Pd-nickel alloy, a Pd-Co alloy, a Pd-Ag alloy, a Pd-Cu alloy, etc. can use it. Pd or Pd alloy coat 24 is based on electrolysis plating and nonelectrolytic plating, and also it can be formed by the thin film forming methods, such as sputtering, and as shown in the example mentioned later, it sets the thickness to 0.3 micrometers or less. When the thickness of Pd or Pd alloy coat 24 exceeds 0.3 micrometers, in case an outer lead is bent, it is easy to generate a crack in Pd or Pd alloy coat 24.

Au plating coat 28 is formed all over a leadframe 10, or is formed on an outer lead 12 at least.

Au plating coat 28 is formed in an about [monoatomic layer (about 0.001 micrometers) - 0.1micrometer] very thin coat. When Au plating coat 28 is less than 0.001 micrometers, it becomes inadequate functioning as antioxidizing film of Pd or Pd alloy coat here. on the other hand, when Au plating coat 28 exceeds 0.1 micrometers, not to mention the cost of a leadframe becoming high When it is finally obtained and ***** is mounted in a mounting substrate, Sn and the Au-Sn alloy in the solder used as wax material are formed, and there is a possibility that junction to the outer lead of a leadframe and a mounting substrate may become easy to exfoliate.

Since selection of plating conditions becomes difficult in having usually used the plating

bath of concentration in order to form Au plating coat 28 thinly, it is good to use the very low-concentration plating bath whose Au concentration is about 5-1000 ppm.

By forming thin Au plating coat 28 on the substrate of Pd or Pd alloy coat 24 as mentioned above Even if a leadframe 10 passes through the heat histories at the time of chip loading etc., degradation by oxidation of Pd or Pd alloy coat 24 can be prevented. Moreover, as soldering nature of an outer lead 12, since it was thermally stable, while the Au plating coat itself could raise the solder wetted area ratio, time amount until it wets a required wetted area could be shortened sharply, and it has improved workability.

Since Au plating coat 28 is an about [monoatomic layer -0.1micrometer] thin coat, it serves as the property of Pd or Pd alloy coat, and a good property having the property of Au plating coat as a surface characteristic of a leadframe.

Although Au plating coat 28 has the property which was excellent in soldering nature from the first, it thickness-attaches in respect of cost, and it is not made. When it forms thinly on a material on the other hand (for example, when it forms thinly on a copper material), a copper material oxidizes and it has a bad influence on soldering nature.

In this point this invention, Au plating coat 28 protects Pd or Pd alloy coat 24 of a substrate, on the other hand, since Pd which has the property which was excellent in the substrate in it being thin, or Pd alloy coat 24 exists, the weak spot of both coats is filled up and Au plating coat 28 can raise the soldering nature of an outer lead 12 according to that synergistic effect.

When Au plating coat 28 is formed on the chip loading section 16 and an inner lead 14, since Au plating coat 28 is thin, Au plating coat 28 is dissolved at the time of wirebonding to an inner lead 14, and wirebonding is made on Pd or Pd alloy coat 24. Even if it does not form Au plating coat 28 on the chip loading section 16 and an inner lead 14, since it is at the phase where it has not yet passed through most heat histories, Pd or Pd alloy coat 24 does not deteriorate, therefore can perform chip loading and wirebonding good.

[Example]

The result of having compared soldering nature about what formed 1 micrometer of nickel plating coats on the leadframe of Cu material, and formed 0.1 micrometers of Pd plating coats on it, and the thing which formed 0.01 micrometers of Au plating coats on it further is shown in Table 1.

表 1
はんだ浴温 220°C

	Ni/Pd		Ni/Pd/Au	
	濡れ面 積比	時間	濡れ面 積比	時間
310°C × 1分加熱後	95%	3秒	100%	1秒
330°C × 1分加熱後	70%	10秒	100%	1秒

Au plating bath used the thing of the following presentation.

KAu2 (CN) 10 - 2000ppmKCN 10-50g/l. The time amount which the wetted area ratio of direction improves although Au plating coat was formed on Pd plating coat so that clearly from Table 1, and it takes is shortened sharply.

[Example 2]

The result of having compared soldering nature about the thing in which 0.3 micrometers of Pd plating coats were formed on the leadframe of 42 alloys [a Fe-nickel alloy], and the thing which formed 0.005 micrometers of Au plating coats on it further is shown in Table 2.

表 2
はんだ浴温 220°C

	Pd		Ni/Pd/Au	
	濡れ面 積比	時間	濡れ面 積比	時間
310°C × 1分加熱後	98%	3秒	100%	1秒
330°C × 1分加熱後	80%	9秒	100%	1秒

The time amount which the wetted area ratio of direction improves although Au plating coat was formed on Pd plating coat so that clearly from Table 2, and it takes is shortened sharply.

(Effect of the invention)

According to the leadframe for semiconductor devices which starts this invention as mentioned above, it gets wet, compaction of time amount can be aimed at, and it excels in soldering nature, and the improvement in solder wettability and the higher efficacy that the workability of soldering improves are done so.

TECHNICAL FIELD

(Field of the Invention)

This invention relates to the leadframe for semiconductor devices.

EFFECT OF THE INVENTION

(Effect of the invention)

According to the leadframe for semiconductor devices which starts this invention as mentioned above, it gets wet, compaction of time amount can be aimed at, and it excels

in soldering nature, and the improvement in solder wettability and the higher efficacy that the workability of soldering improves are done so.

TECHNICAL PROBLEM

(A Prior art and its trouble)

It is required that the leadframe for semiconductor devices should have the good junction nature of a semiconductor chip and the good wirebonding nature of the wire which connects an inner lead with a semiconductor chip, and it should have the good soldering nature in the case of connection with the external instrument of an outer lead.

Therefore, in order to form Part Ag or a partial Au plating coat in the chip loading section and an inner lead in order to obtain the good junction nature or the good wirebonding nature of a semiconductor chip, and to obtain good soldering nature to an outer lead on the other hand conventionally, he is trying to form a solder coat. However, the man day increased and it was very uneconomical to have formed a metallic film of a different kind in the chip loading section, an inner lead, and an outer lead in this way.

So, in recent years, the leadframe which formed Pd or Pd alloy coat in the chip loading section, the inner lead, and the outer lead is beginning (JP,59-168659,A) to be used.

Since Pd or Pd alloy coat is chemically stable, it has the good junction nature of a semiconductor chip, and good wirebonding nature, and since solder wettability is also good, the soldering nature of an outer lead is also good. Moreover, since Pd or Pd alloy coat is formed all over a leadframe, there is an advantage which can also perform simplification of a process.

MEANS

(The means for solving a technical problem)

In the leadframe for semiconductor devices concerning this invention for the above-mentioned purpose, while 0.3-micrometer or less Pd in thickness or Pd alloy coat is formed through the direct or substrate metallic film all over the material, it is characterized by being formed at the thickness whose Au plating coat is 0.001-0.1 micrometers on Pd formed in the outer lead of said leadframe, or Pd alloy coat.

OPERATION

(Operation)

As mentioned above, although Pd or Pd alloy coat is excellent in the junction nature of a semiconductor chip, wirebonding nature, and soldering nature, it deteriorates by the heat history and has the problem to which the soldering nature of an outer lead falls.

On the other hand, although Au plating coat has thermal stability and being excelled in soldering nature, if it forms thinly in order for cost to go up and to avoid this, if it

thickness-attaches and carries out, soldering nature will be checked by oxidation of a material metal or a substrate metal etc.

In this invention, Au plating coat was thinly formed on Pd or Pd alloy coat. Both faults are filled up by this and the soldering nature of an outer lead improves. That is, since Au plating coat acts as a protective layer of Pd or Pd alloy coat, degradation by oxidation of Pd or Pd alloy coat is prevented and Au plating coat, on the other hand, does not have a bad influence from Pd or Pd alloy coat of a substrate as it is thin, the original good soldering nature of both coats is maintainable. Consequently, very good soldering nature is obtained from the property of both coats being demonstrated to the maximum extent. Moreover, especially solder **** time amount can be shortened and workability improves.

EXAMPLE

(Example)

The example with suitable this invention for below is explained to a detail based on an accompanying drawing.

In the leadframe 10 shown in Fig. 1 , 12 is connected to rails 20 and 20 by the support bar 18 in the chip loading section in which, as for an outer lead and 14, an inner lead is carried, and, as for 16, a semiconductor chip (not shown) is carried. 22 is a dambar. a semiconductor device [on a leadframe 10, the necessary metallic film which carries out a postscript is formed, a semiconductor chip is carried in the chip loading section 16 the back, this semiconductor chip and inner lead 14 are connected with a wire, and the closure of a semiconductor chip, a wire, and the inner lead 14 is carried out with closure resin, and] -- it is completed. the outer lead 12 top of this semiconductor device -- oh, a **** solder coat is formed, or a solder coat is formed at the time of mounting to a substrate, and it is soldered to the predetermined location on a substrate.

In this invention, it is characterized by forming Pd or Pd alloy coat the whole surface on a leadframe material, and forming Au plating coat thinly on it further.

Especially the material of a leadframe can use materials usually used, such as Cu or Cu alloy, and a Fe-nickel alloy, without being limited.

As shown in Fig. 2 , Pd or Pd alloy coat 24 is formed through the substrate plating coats 26, such as nickel plating coat, on a material, or is directly formed on a material depending on the quality of the material of a material. As a Pd alloy, a Pd-nickel alloy, a Pd-Co alloy, a Pd-Ag alloy, a Pd-Cu alloy, etc. can use it. Pd or Pd alloy coat 24 is based on electrolysis plating and nonelectrolytic plating, and also it can be formed by the thin film forming methods, such as sputtering, and as shown in the example mentioned later, it sets the thickness to 0.3 micrometers or less. When the thickness of Pd or Pd alloy coat 24 exceeds 0.3 micrometers, in case an outer lead is bent, it is easy to generate a crack in Pd or Pd alloy coat 24.

Au plating coat 28 is formed all over a leadframe 10, or is formed on an outer lead 12 at least.

Au plating coat 28 is formed in an about [monoatomic layer (about 0.001 micrometers) - 0.1 micrometer] very thin coat. When Au plating coat 28 is less than 0.001 micrometers, it becomes inadequate functioning as antioxidizing film of Pd or Pd alloy coat here. on the other hand, when Au plating coat 28 exceeds 0.1 micrometers, not to mention the cost of a leadframe becoming high When it is finally obtained and ***** is mounted in a mounting substrate, Sn and the Au-Sn alloy in the solder used as wax material are formed, and there is a possibility that junction to the outer lead of a leadframe and a mounting substrate may become easy to exfoliate.

Since selection of plating conditions becomes difficult in having usually used the plating bath of concentration in order to form Au plating coat 28 thinly, it is good to use the very low-concentration plating bath whose Au concentration is about 5-1000 ppm.

By forming thin Au plating coat 28 on the substrate of Pd or Pd alloy coat 24 as mentioned above Even if a leadframe 10 passes through the heat histories at the time of chip loading etc., degradation by oxidation of Pd or Pd alloy coat 24 can be prevented. Moreover, as soldering nature of an outer lead 12, since it was thermally stable, while the Au plating coat itself could raise the solder wetted area ratio, time amount until it wets a required wetted area could be shortened sharply, and it has improved workability.

Since Au plating coat 28 is an about [monoatomic layer - 0.1 micrometer] thin coat, it serves as the property of Pd or Pd alloy coat, and a good property having the property of Au plating coat as a surface characteristic of a leadframe.

Although Au plating coat 28 has the property which was excellent in soldering nature from the first, it thickness-attaches in respect of cost, and it is not made. When it forms thinly on a material on the other hand (for example, when it forms thinly on a copper material), a copper material oxidizes and it has a bad influence on soldering nature.

In this point this invention, Au plating coat 28 protects Pd or Pd alloy coat 24 of a substrate, on the other hand, since Pd which has the property which was excellent in the substrate in it being thin, or Pd alloy coat 24 exists, the weak spot of both coats is filled up and Au plating coat 28 can raise the soldering nature of an outer lead 12 according to that synergistic effect.

When Au plating coat 28 is formed on the chip loading section 16 and an inner lead 14, since Au plating coat 28 is thin, Au plating coat 28 is dissolved at the time of wirebonding to an inner lead 14, and wirebonding is made on Pd or Pd alloy coat 24. Even if it does not form Au plating coat 28 on the chip loading section 16 and an inner lead 14, since it is at the phase where it has not yet passed through most heat histories, Pd or Pd alloy coat 24 does not deteriorate, therefore can perform chip loading and wirebonding good.

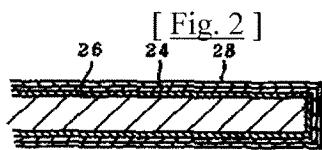
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

Fig. 1 shows the explanatory view of a leadframe and Fig. 2 shows the sectional view of an outer lead.

10 [.. The chip loading section 24 / .. Pd or Pd alloy coat, 28 / .. Au plating coat.] A leadframe, 12 .. An outer lead, 14 .. An inner lead, 16

DRAWINGS



[Fig. 1]

